

What is claimed is:

1. An exhaust gas turbine for an internal combustion engine connected to an exhaust pipe of the engine, which comprises:

an exhaust gas turbine inlet port for guiding exhaust gas
5 into said turbine;

an exhaust gas catalyst inlet port for guiding the exhaust gas to a catalyst, the exhaust gas after passing through said turbine being guided into said exhaust gas catalyst inlet port; and

10 an open/close valve for opening and closing said exhaust gas catalyst inlet port.

2. An exhaust gas turbine for an internal combustion engine, which comprises:

an exhaust gas passage for guiding exhaust gas into a
15 catalyst, said exhaust gas passage being connected to an exhaust passage of said engine;

a bypass exhaust passage integrated with said exhaust gas passage as a unit; and

a turbine, which is attached to said bypass exhaust passage.

20 3. An exhaust gas turbine for an internal combustion engine according to any one of claims 1 and 2, which comprises an open/close valve which is arranged in said exhaust gas catalyst inlet port or in an inlet of said exhaust gas passage guiding the exhaust gas into said catalyst.

25 4. An exhaust gas turbine for an internal combustion engine according to any one of claims 1 to 3, wherein a supercharger disposed in an intake air passage of said internal combustion engine is attached so as to be driven by said turbine.

5. An exhaust gas turbine for an internal combustion engine

according to any one of claims 1 to 3, wherein an electric generator of said internal combustion engine is attached so as to be driven by said turbine.

6. An exhaust gas turbine for an internal combustion engine
5 having a waste gate valve, wherein said waste gate valve is constructed so as to be kept open during a starting period of operation of said engine.

7. An exhaust gas turbine for an internal combustion engine
10 having a waste gate valve which is attached together with a catalyst to an exhaust passage of said internal combustion engine, wherein said waste gate valve is constructed so as to be kept open during a starting period of operation of said engine to directly guide exhaust gas into said catalyst.

8. An exhaust gas turbine for an internal combustion engine
15 placed in an exhaust passage, which comprises:

a turbine case having a passage for guiding exhaust gas into said turbine and a bypass passage bypassing said turbine, said passage and said bypass passage being arranged in parallel; and

20 a switching valve mechanism for switching which of said both passages the exhaust gas is allowed to flow through.

9. An exhaust gas turbine for an internal combustion engine placed in an exhaust passage, which comprises:

25 a turbine case having a first passage for guiding exhaust gas into said turbine and a bypass passage bypassing said turbine, said first passage and said bypass passage being arranged in parallel;

a separating wall for separating between said first passage and said bypass passage;

an opening arranged in said separating wall, a waste gate being attached to said opening; and

an open/close valve arranged at an inlet of said bypass passage.

- 5 10. An exhaust gas turbine for an internal combustion engine placed in an exhaust passage, which comprises:

a turbine case having an exhaust passage for guiding exhaust gas into said turbine, said exhaust passage being formed in said turbine case;

- 10 a bypass passage for conducting the exhaust gas downstream of said turbine by bypassing said turbine, said bypass passage being arranged at a position in said exhaust passage upstream of said turbine; and

an open/close valve for controlling so that said bypass
15 passage may be brought to a large flow state of the exhaust gas during a starting period of operation of said engine and controlling so that said bypass passage may be closed or brought to a small flow state during the other operating state of said engine.

- 20 11. An exhaust turbo-supercharger for an internal combustion engine comprising a turbine impeller and a turbine case enclosing said turbine impeller, said turbine impeller being rotated by exhaust gas of said internal combustion engine; a compressor
25 impeller rotated and a compressor case enclosing said compressor impeller, said compressor impeller being fixed on and rotated by a turbine shaft integrated with said turbine impeller as a unit; a radial bearing part for supporting said turbine shaft in the radial direction; a thrust bearing part for supporting said turbine shaft in the thrust direction; and a bearing housing

for supporting the bearing portions, which further comprises:

an exhaust bypass flow passage, said exhaust bypass flow passage being independent of and arranged in parallel with a turbine case scroll flow passage for guiding the exhaust gas into said turbine impeller; and

a valve seat plane and an exhaust bypass valve in said exhaust bypass flow passage.

12. An exhaust turbo-supercharger for an internal combustion engine comprising a turbine impeller and a turbine case enclosing said turbine impeller, said turbine impeller being rotated by exhaust gas of said internal combustion engine; a compressor impeller rotated and a compressor case enclosing said compressor impeller, said compressor impeller being fixed on and rotated by a turbine shaft integrated with said turbine impeller as a unit; a radial bearing part for supporting said turbine shaft in the radial direction; a thrust bearing part for supporting said turbine shaft in the thrust direction; and a bearing housing for supporting the bearing portions, which further comprises:

an exhaust bypass flow passage, said exhaust bypass flow passage connecting a turbine case inlet flow passage for guiding the exhaust gas to said turbine impeller with a turbine case outlet flow passage for discharging the exhaust gas passed through said turbine impeller out of said turbine case; and

a valve seat plane and an exhaust bypass valve in said exhaust bypass flow passage, a driving actuator of said exhaust bypass valve being driven by a motor.

13. An exhaust turbo-supercharger for an internal combustion engine according to claim 11, which comprises a turbine outlet in a downstream side in a flow direction of the exhaust gas flowing

in said exhaust bypass flow passage.

14. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 to 13, wherein an exhaust manifold and said turbine case are integrated as a unit.

5 15. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 to 13, wherein said turbine case is of a double wall structure forming a hollow inside a wall of said turbine case.

16. An exhaust turbo-supercharger for an internal combustion
10 engine according to any one of claims 11 to 15, which comprises:

an intake air bypass flow passage, said intake air flow passage connecting a compressor case inlet flow passage for guiding intake air into said compressor impeller with a compressor outlet flow passage for guiding the intake air passed through

15 said compressor impeller; and

an intake air bypass valve and a valve seat in said intake air bypass flow passage.

17. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 to 15, wherein a movable
20 part forming a compressor case R-profile opposite to a blade outer peripheral R-profile of said compressor impeller is movable in an axial direction of said turbine shaft.

18. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 and 13 to 17, wherein
25 a driving actuator of said exhaust bypass valve is driven by a motor.

19. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 and 13 to 17, wherein a solenoid valve is used for a driving actuator of said exhaust

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bypass valve.

20. An exhaust turbo-supercharger for an internal combustion engine according to claim 16, wherein a driving actuator of said intake air bypass valve is driven by a motor.

5 21. An exhaust turbo-supercharger for an internal combustion engine according to claim 16, wherein a solenoid valve is used for a driving actuator of said intake air bypass valve.

22. An exhaust turbo-supercharger for an internal combustion engine according to claim 17, wherein a driving actuator of said
10 movable part forming the compressor case R-profile opposite to the blade outer peripheral R-profile of said compressor impeller is driven by a motor.

23. An exhaust turbo-supercharger for an internal combustion engine according to claim 17, wherein a solenoid valve is used
15 for a driving actuator of said movable part forming the compressor case R-profile opposite to the blade outer peripheral R-profile of said compressor impeller.

24. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 11 and 13 to 17, wherein
20 said exhaust bypass valve is kept open during a starting period of operation of said internal combustion engine.

25. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 16, 20, 21 and 24, wherein said intake bypass valve is kept open while said exhaust bypass
25 valve is kept open.

26. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 17, 22 to 24, wherein said movable part forming the compressor case R-profile opposite to the blade outer peripheral R-profile of said compressor impeller

is kept apart from the blade outer peripheral R-profile of said compressor impeller while said exhaust bypass valve is kept open.

27. An exhaust turbo-supercharger for an internal combustion engine according to any one of claims 24 to 26, wherein while
5 said exhaust bypass valve is kept open during a starting period of operation of said internal combustion engine, an amount of fuel is controlled so that temperature of the exhaust gas may be increased by making an air-to-fuel ratio rich.

28. An exhaust turbo-supercharger for an internal combustion
10 engine according to any one of claims 11, 13 to 27, wherein catalyst
is placed inside a flow passage of said turbine case outlet.

29. An internal combustion engine comprising an exhaust turbo-supercharger and a catalyst, wherein said catalyst is disposed in an exhaust flow passage portion where temperature of exhaust gas is higher than temperature of exhaust gas in a turbine impeller portion.

30. An exhaust turbo-supercharger for an internal combustion engine, in the internal combustion engine comprising the exhaust turbo-supercharger, which comprises an exhaust bypass flow passage independent of and arranged in parallel with a turbine flow passage for guiding exhaust gas into said turbine impeller.

31. An exhaust turbo-supercharger for an internal combustion engine according to claim 30, wherein a flow passage resistance of the exhaust bypass passage is smaller than a flow passage resistance of the turbine flow passage.

32. An exhaust turbo-supercharger for an internal combustion engine, in the internal combustion engine comprising the exhaust turbo-supercharger and a catalyst, which comprises a catalyst mounting portion in a turbine outlet portion.

33. An exhaust turbo-supercharger for an internal combustion engine, in the internal combustion engine comprising the exhaust turbo-supercharger, which comprises:

an exhaust bypass flow passage which is independent of
5 and arranged in parallel with a turbine flow passage for guiding
exhaust gas into a turbine impeller;

a valve seat plane and an exhaust bypass valve in said exhaust bypass flow passage, a flow passage resistance of said exhaust bypass flow passage being smaller than a flow passage resistance of the turbine flow passage; and

a catalyst mounting portion in a turbine outlet portion.

34. An exhaust turbo-supercharger for an internal combustion engine, in the internal combustion engine comprising the exhaust turbo-supercharger, wherein an exhaust bypass flow passage independent of and arranged in parallel with a turbine flow passage for guiding exhaust gas into a turbine impeller is formed, and an exhaust flowing portion from an exhaust manifold to the exhaust bypass passage and a turbine outlet are connected by a straight pipe.

20 35. An exhaust turbo-supercharger for an internal combustion engine, wherein an exhaust manifold and a turbine case are formed of a single member.

36. An exhaust turbo-supercharger for an internal combustion engine, wherein a thermal insulation mechanism is provided in a turbine case.

37. An exhaust turbo-supercharger for an internal combustion engine, which comprises an exhaust bypass valve in order to thermally insulate a turbine case.

38. An exhaust turbo-supercharger for an internal combustion

engine, wherein an inner wall surface of a turbine flow passage is coated with ceramic.

39. An exhaust turbo-supercharger for an internal combustion engine, which comprises a porous material on an inner wall surface of turbine flow passage.

40. An exhaust turbo-supercharger for an internal combustion engine, which comprises a mechanism in an intake air flow passage, said intake air flow passage being capable of making intake air bypassing a compressor.

41. An exhaust turbo-supercharger for an internal combustion engine according to claim 40, which comprises an intake air bypass flow passage connecting a compressor case inlet flow passage for guiding intake air into a compressor impeller with a compressor case outlet flow passage for guiding intake air passed through said compressor impeller to the outside of a compressor case; and an intake air bypass valve and a valve seat in said intake air bypass flow passage.

42. An exhaust turbo-supercharger for an internal combustion engine according to claim 40, wherein a movable part forming a compressor case R-profile opposite to a blade outer peripheral R-profile of said compressor impeller is movable in an axial direction of a turbine shaft.

43. An exhaust turbo-supercharger for an internal combustion engine, in the internal combustion engine comprising the exhaust turbo-supercharger, which comprises an exhaust bypass valve and a valve seat for the exhaust bypass valve in an exhaust bypass flow passage, an opening area of said exhaust bypass valve being changed by moving said exhaust bypass valve into and out of an opening portion of said valve seat.

44. An exhaust turbo-supercharger for an internal combustion engine, which comprises a mechanism in an exhaust flow passage, said mechanism making exhaust gas flow out by bypassing a turbine.

45. An exhaust turbo-supercharger for an internal combustion
5 engine according to any one of claims 11, 13 to 17, wherein an
exhaust gas inlet portion of said exhaust bypass flow passage
and said turbine outlet are connected by a straight pipe, and
said exhaust gas bypass valve is opened during a starting period
of operation of the internal combustion engine to make exhaust
10 gas flow by bypassing said turbine.

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ABSTRACT OF THE DISCLOSURE

In order to activate a catalyst in a short time in an internal combustion engine having a turbine, an exhaust bypass flow passage and an exhaust bypass valve and its valve seat provided in the exhaust bypass flow passage are set to sizes large enough to be able to make almost all the amount of the exhaust gas bypass the turbine, and the exhaust bypass valve is controlled by a driving actuator using a motor or a solenoid. Rapid activation of the catalyst is implemented by totally opening the exhaust bypass valve during the starting period of operation of the internal combustion engine to make almost all the amount of exhaust gas flow into the catalyst by bypassing the turbine. Since almost all the amount of exhaust gas flows into the catalyst by bypassing the turbine by totally opening the exhaust bypass valve during the starting period of operation of the internal combustion engine, the activation of the catalyst is hardly retarded compared to a case where no turbine exists in the downstream side of the exhaust manifold.

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